(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(54) Title: CONTROL OF DEPTH MOVEMENT FOR VISUAL DISPLAY WITH LAYERED SCREENS

(A)   (B)
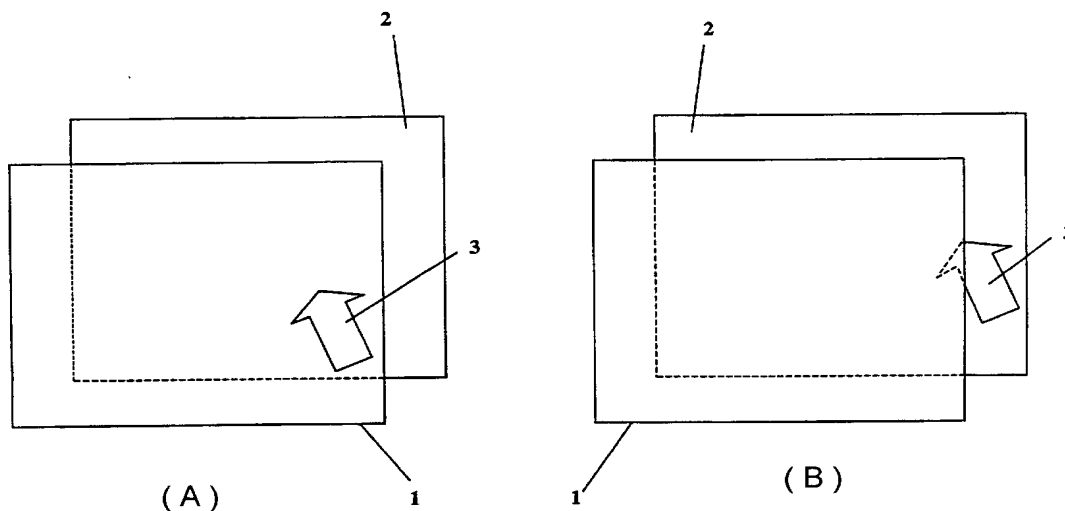
(57) Abstract: A multi-level visual display system has a plurality of screens (1, 2) spaced in the depth direction. A user can move a visual indicator such as a cursor (3) between the screens (1, 2), via an input device such as a mouse button. In drawing applications a visual link such as a line can be created between two screens. In game applications a user can move an image both within and between screens (1, 2), by dragging a cursor while moving it between the screens, to provide an illusion of three dimensional movement. The screens (1, 2) may comprise layered liquid crystal displays.

CONTROL OF DEPTH MOVEMENT FOR VISUAL DISPLAY WITH LAYERED SCREENS

TECHNICAL FIELD

This invention relates to a visual display system.

BACKGROUND ART

5   Particularly, the present invention relates to a visual display system including multi-level screens which are placed physically apart.

Such screens are described in PCT Application Nos. PCT/NZ98/00098 and PCT/NZ99/00021.

These devices are created by combining multiple layers of selectively transparent
10   screens. Each screen is capable of showing an image. In preferred embodiments the screen layers are liquid crystal display. Preferably the screens are aligned parallel to each other with a pre-set distance between them.

With this device images displayed on the screen furthest from view (background screen) will appear at some distance behind the images displayed on the screen closer
15   to the viewer (foreground screen). The transparent portions in the foreground screen will allow viewers to see images displayed on the background screen.

This arrangement allowing multiple screens allows images to be presented at multiple levels giving the viewer true depth without use of glass or lens.

Up until now, software has been written to create visual sequences on the multi-level
20   screens. These sequences have been mainly passive, mainly for viewing rather than for interaction.

While the visual effect of these sequences is spectacular, it will be desirable if

potential uses of a multi-level screen display could be explored further.

It is an object of the present invention to address this problem, or at least to provide the public with a useful choice.

Aspects of the present invention will now be described by way of example only with
5   reference to the following description.

DISCLOSURE OF INVENTION

According to one aspect of the present invention there is provided a visual display system including

multi-level screens spaced physically apart,

10   wherein each screen has a two-dimensional plane,

a visual indicator,

an input device,

a user selectable input,

the visual display system being characterised in that

15   the user can use the user selectable input to move the visual indicator via the input device out of the two-dimensional plane of a particular screen.

According to another aspect of the present invention there is provided a method of using a visual display system which has multi-level screens spaced physically apart,

wherein each screen has a two-dimensional plane,

20   the visual display system also including

a visual indicator,

an input device,

a user selectable input,

the method characterised by the step of

5   the user using the selectable input to move the visual indicator out of the two-dimensional plane of a particular screen and on to another screen and on to another screen.

One aspect of the present invention there is provided media containing instructions for the operation of visual display system as described.

10   In preferred embodiments of the present invention the multi-level screens are similar to that described in PCT Application Nos. PCT/NZ98/00098 and PCT/NZ99/00021, although this should not be seen as limiting.

The term two-dimensional plane refers to the effective viewing plane on a particular screen, similar to that seen on a normal display screen.

15   The visual indicator may be any type of indicator, for example a cursor, image, icon or screen image. It is envisaged that the visual indicator is something which can move in response to the user of the system via some input mechanism.

The input device may be any suitable input device, for example a mouse, tablet data glove, keyboard, touch screen, joystick, trackball, pen, stylus, touch pad, voice and so

20   forth.

The user selectable input is preferably an input the user can make to effect the operation of software running the display device via the input device.

For example, if the input device is a mouse, then the user selectable input may be a mouse button. If the input device is a joystick, then the user selectable input may be the trigger. If the user input is a keyboard, then the user selectable input may be arrow keys. And so forth.

5   We envisage that the present invention could be used extensively by those in the graphics industry. Therefore one embodiment in the present invention is envisaged that by having the input device as a pen or stylus, the present invention could be utilised in theses industries to its fullest.

In some embodiments, the user selectable input may actually be a software button on

10   a touch screen that may be independent of the input device. This allows standard input devices and drivers to be used without modification.

In further embodiments of the present invention, the input device shall be referred to as a mouse and the user selectable input shall be referred to as a mouse button. The mouse button may be an existing button on the mouse, or in some embodiments may

15   be a dedicated button for use with the present invention.

This should not be seen as limiting.

The visual indicator shall now be referred to as a cursor, although this should not be seen as limiting.

The user can use a mouse to move a cursor around a display screen as can be

20   achieved with usual software. However, with one embodiment of the present invention, the user can then click a particular mouse button to cause the visual indicator to move from one screen to another screen. In one embodiment the applicant uses the centre button or a configurable button on a three button mouse, but this should not be seen as limiting

An preferred embodiments the software controlling the cursor position is supplemental to usual mouse drives.

Therefore a program can run as usual with standard mouse drive commands but the cursor position between screens can change as a consequence of the interaction of the supplemental program responding to the additional input from the mouse.

This ability enables the user to actually interact with different screens and work on separate screens in terms of having an input device which can interact with whichever screen has been selected. The advantages of this feature are self apparent.

In some embodiments, the movement from the two-dimensional plane of one screen to another screen may be discrete and it may appear that the visual indicator merely jumps from one screen to the other and be at the same x-y coordinate with the only change being in the z axis.

In other embodiments, there may be more of a linear movement perceived as a consequence of the movement from one screen to the other.

For example, the present invention may be used in conjunction with a drawing package. The person drawing may start drawing on the front screen of the visual device using the mouse and cursor.

The person then may wish to take advantage of the three dimensional quality allowed by the present invention and effectively draw in the z axis (the x and y axis having already been drawn in on the two-dimensional screen). This may be achieved by the user clicking the mouse button and dragging the cursor effectively so it appears to pass from one screen to the other screen with an image (say a line) appearing to provide a visual bridge between the front screen and another screen or screens in the background.

In other embodiments of the present invention this ability may be used with particular total screen images. For example, the present invention may be used with an interactive game which gives the impression that the user is moving deep within a scene. For example, the user may be flying a craft in the game and as the user moves forward in the game, the images may pass from the background screen or screens to the foreground screen giving the illusion of full movement. In this embodiment the visual indicator may be the images and the input device a joy-stick.

Aspects of the present invention will now be described with reference to the following drawings which are given by way of example only.

BRIEF DESCRIPTION OF DRAWINGS

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1   illustrates one embodiment of the present invention, and

Figure 2   illustrates a second embodiment of the present invention, and

Figure 3   illustrates a third embodiment of the present invention.

BEST MODES FOR CARRYING OUT THE INVENTION

Figures 1a and 1b illustrate a stylised version of one embodiment of the present invention at work. These figures have foreground screens 1 and background screens 2.

It should be appreciated that the reference to just two screens is by way of example only and the present invention may work in relation to multiple numbers of screens.

Figure 1a shows the positioning of the visual indicator 3 in the form of a cursor arrow

on the front foreground screen 1.

In this embodiment of the present invention a simple click of a mouse button causes the cursor 3 to appear in exactly the same x y coordinates as on the foreground screen one, but, positioned on the background screen 2.

5   Thus in this embodiment, the user selectable input merely does a direct transpose in the z axis between screens.

Figure 2 likewise has a foreground screen 1 and a background screen 2. In Figure 2a. a triangle 4 has been drawn on the x y two-dimensional plane of the foreground screen 1.

10   In Figure 2b, to give the triangle 4 depth, the user has selected and dragged the image in the x y direction to give not only the image of a triangle 5 on the background screen 2, but also a plane in the z axis 6 for finding a solid-looking representation. As the screens are physically quite separate, the illusion of the solid wall 6 is accomplished by sophisticated software shading techniques.

15   Figure 3 again has a foreground screen 1 and background screen 2.

This embodiment of the present invention can be used for moving through three-dimensional landscapes. For example, in Figure 3a, there is pictured a flower 7 on the foreground screen, tree 8 along with a cloud 9 are positioned on the background screen 2.

20   The user may then use the input device to effectively move through the scene visually. This causes the flower depicted in Figure 3a to disappear from the foreground screen as shown in Figure 3b. This also causes the tree 8 to move from the background screen 2 to the foreground screen 1. The cloud 9 being in the far background stays on the background screen 2.

Thus it can be seen that the present invention allows considerable amount of interaction between the user and the screens.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without
5   departing from the scope of the appended claims.

CLAIMS:

1. A visual display system including

   multi-level screen spaced physically apart,

   wherein each screen has a 2 dimensional plane,

   a visual indicator,

   a input device,

   a user selectable input,

   the visual display system being characterised in that

   the user can use the selectable input to move the visual indicator via the input device out of the 2 dimensional plane of particular screen.

2. A visual display system as claimed in claim 1 wherein the visual indicator is a cursor.

3. A visual display system as claimed in either claim 1 or claim 2 wherein the input device is a mouse.

4. A visual display system as claimed in any one of claims 1 to 3 wherein the user selectable input is a mouse button.

5. A visual display system as claimed in any one of claims 1 to 4 which includes software supplemental to the software drivers for the input device to cause the visual indicator to move from one screen to another screen.

6. A visual display system as claimed in any one of claims 1 to 5 wherein the visual indicator moves to a different z axis coordinate, but the same x – y coordinate.

7. A visual display system as claimed in any one of claims 1 to 6 wherein the movement of the visual indicator from one screen to another screen gives the appearance of providing a visual bridge between the screens.

8. A visual display system as claimed in any one of claims 1 to 7 wherein the visual indicator is a screen image.

9. A method of using a visual display system which has multi-level screens spaced physically apart,

    wherein each screen has a 2 dimensional plane

    the visual display system also including

    a visual indicator,

    a input device,

    a user selectable input,

    a method of characterised by the step of the user using the selectable input to move the visual indicator out of the 2-dimensional plane of a particular screen and onto another screen.

10. A method as claimed in claim 9 wherein a visual indicator is a cursor.

11. A method as claimed in either claim 9 or claim 10 wherein the input device is a mouse.

12. A method as claimed in any one of claims 9 to 11 wherein the user selectable input is a mouse button.

13. A method as claimed in any one of claims 9 to 12 which includes software supplemental to the software drivers for the input device to cause the visual indicator to move from one screen to another screen.

14. A method as claimed in any one of claims 9 to 13 wherein the visual indicator moves to a different z axis coordinate, but the same x – y coordinate.

15. A method as claimed in any one of claims 9 to 14 wherein the movement of the visual indicator from one screen to another screen gives the appearance of providing a visual bridge between the screens.

16. A method as claimed in any one of claims 9 to 15 wherein the visual indicator is a screen image.

17. A visual display system as claimed in any one of claims 1 to 8 wherein the input device is a pen.

18. A method as claimed in any one of claims 9 to 16 wherein the input device is a pen.

19. A method substantially as herein described with reference to and as illustrated by the company drawings.

20. A method of using a visual display system substantially as herein described with reference to and as illustrated by the accompanying drawings.

21. Media containing instructions for the operation of a visual display system as claimed/or described herein.

Fig. 1
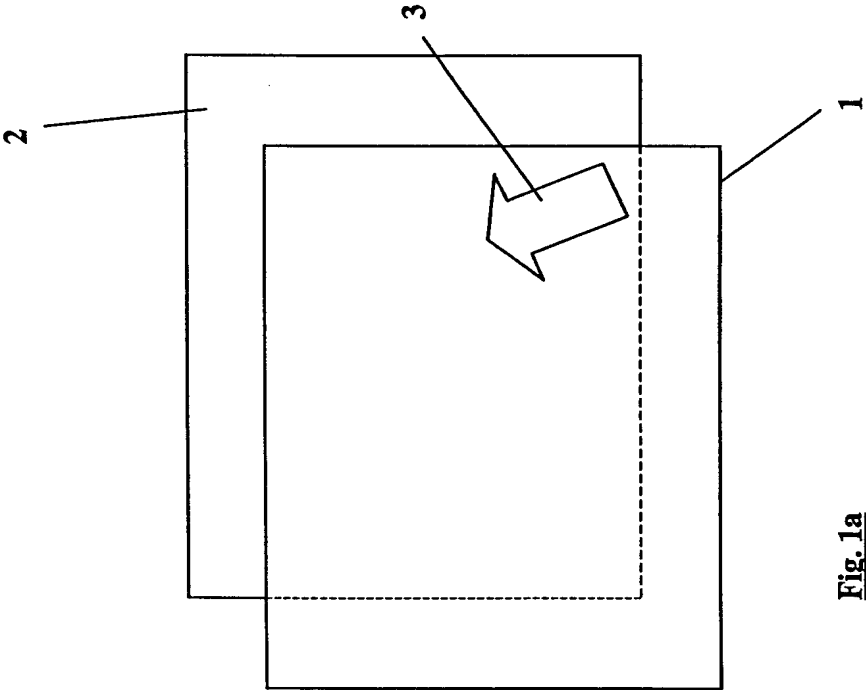
Fig. 1a
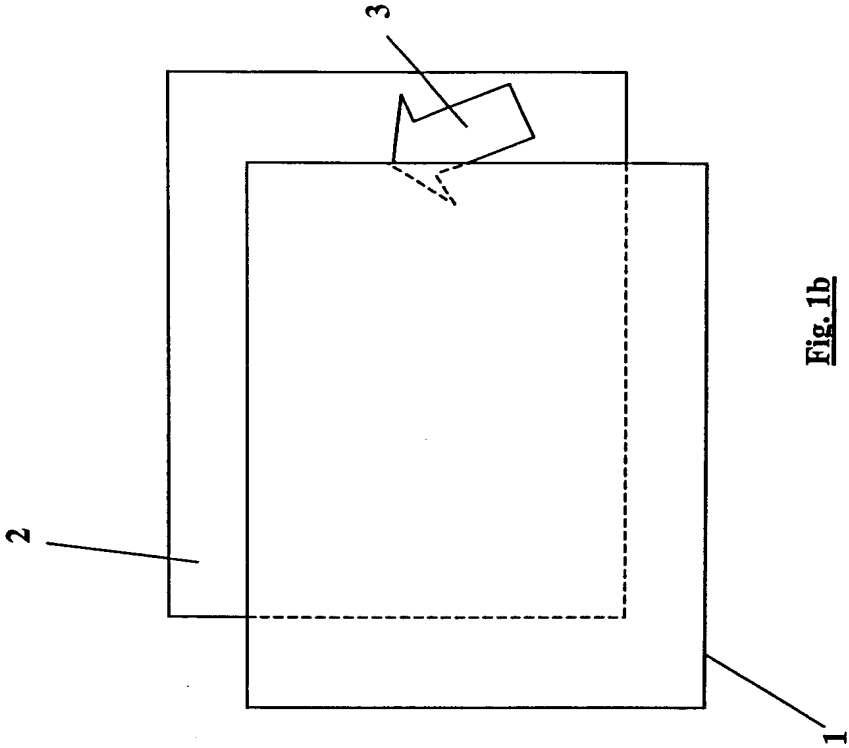
Fig. 1b

Fig. 2b
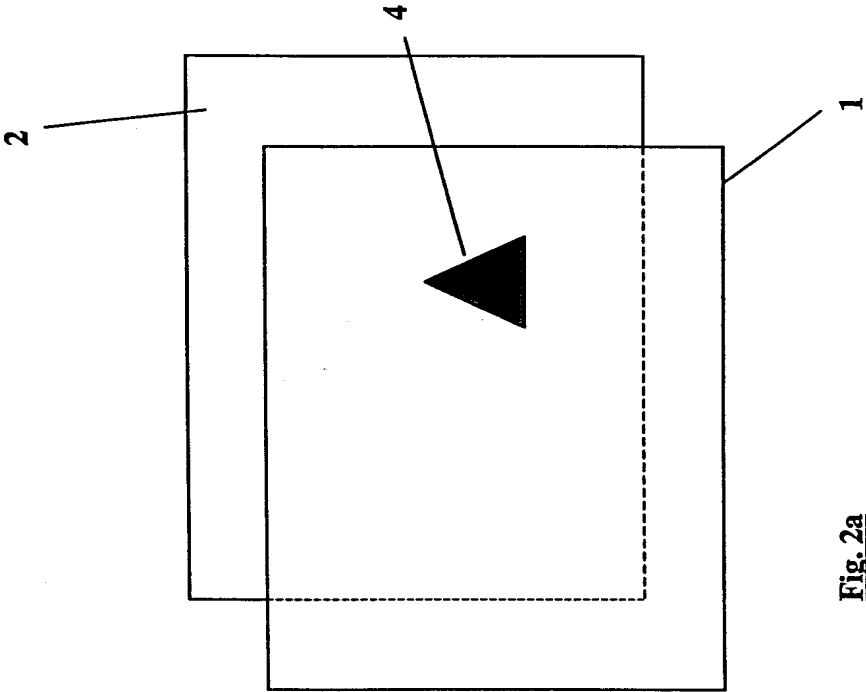
Fig. 2a
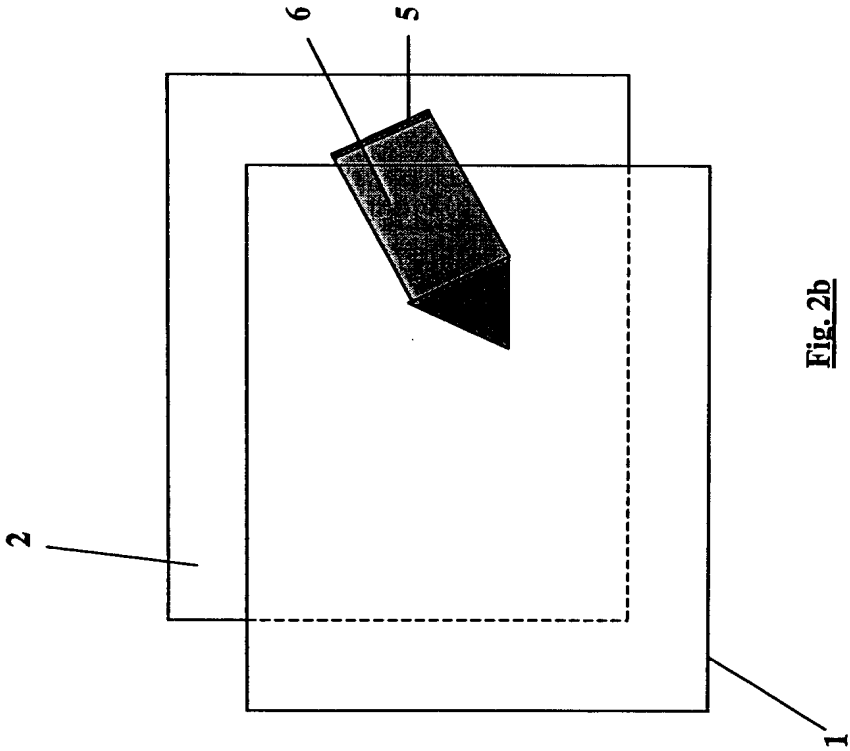
Fig. 2
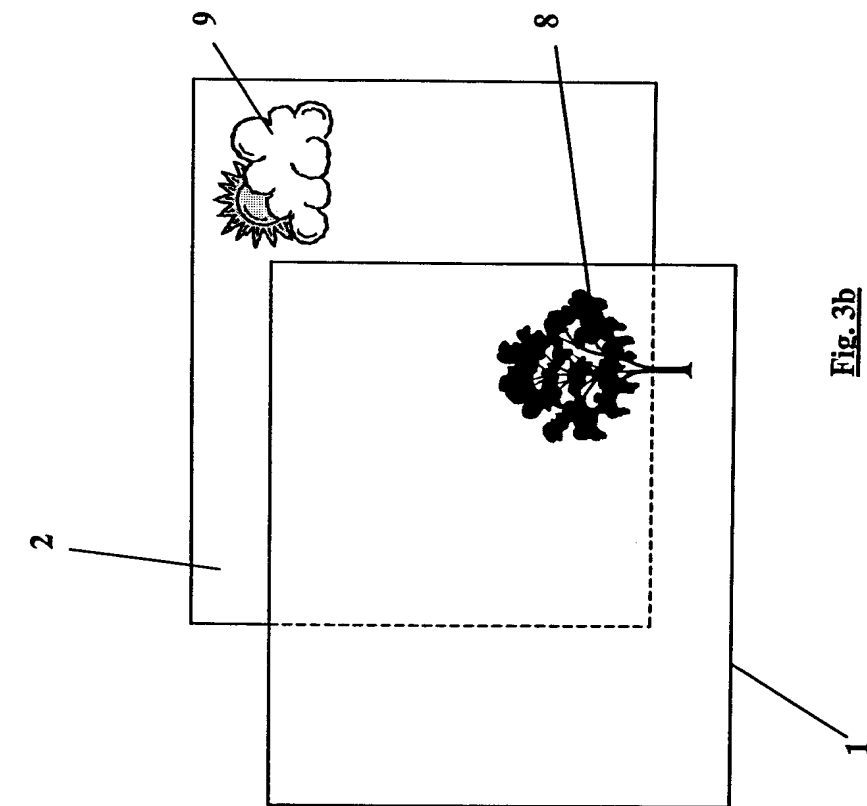
Fig. 3

Fig. 3a
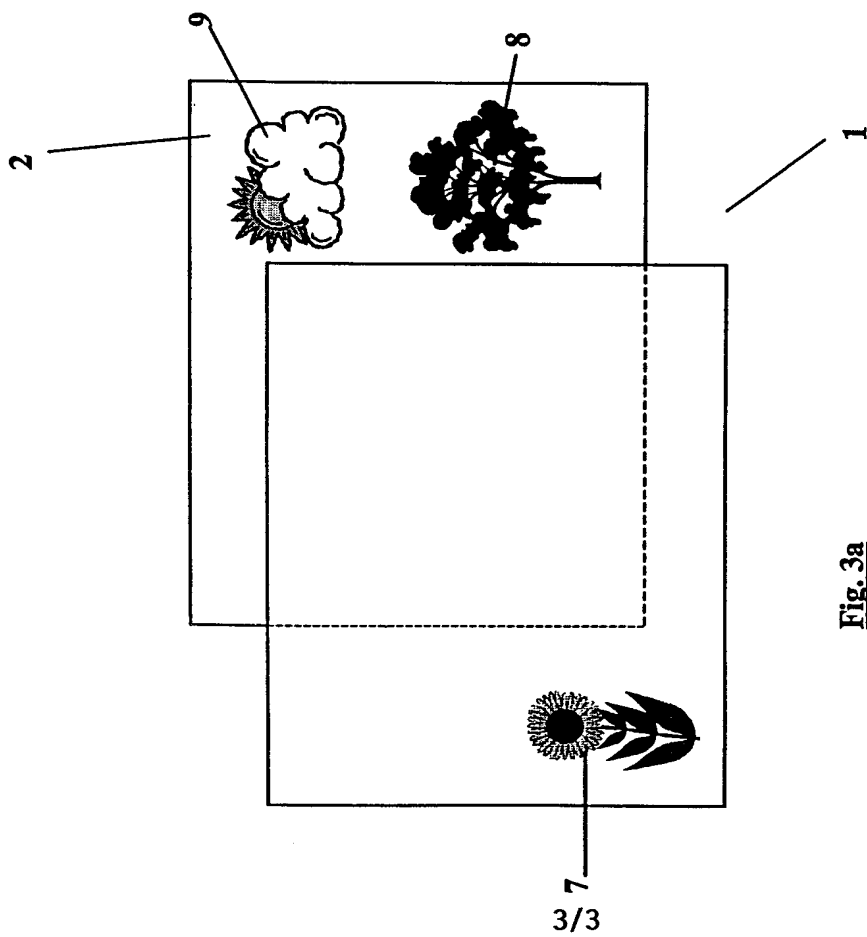
Fig. 3b

International application No.

PCT/NZ00/00160

A.	CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]:   G09G 5/08, G02B 27/22

According to International Patent Classification (IPC) or to both national classification and IPC

B.	FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G02B, G09F, G09G, H04N 13/-, 15/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI, JAPIO

C.	DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5585821 A (ISHIKURA ET AL.) 17 December 1996 Columns 1-4, Figures 2-5	1-3, 5, 8, 9-11, 13, 16-18
Y	US 5473344 A (BACON ET AL.) 5 December 1995 Columns 1-2, 7-10, Figures 1-2	1-20
Y	EP 454423 A (TFE HONG KONG LIMITED) 30 October 1991 Columns 1-3, Figures 1-5	1-20

☐ Further documents are listed in the continuation of Box C   ☒ See patent family annex

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance		
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 November 2000	**2 8 NOV 2000**

Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	**MICHAEL HALL** Telephone No : (02) 6283 2474

Box I	Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [X] Claims Nos : 21

because they relate to subject matter not required to be searched by this Authority, namely:

The scope of the claim includes an instruction manual, which is a mere presentation of information as per PCT Rule 39.1(v).

2. [ ] Claims Nos :

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. [ ] Claims Nos :

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II	Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. [ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims

2. [ ] As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest   [ ] The additional search fees were accompanied by the applicant's protest.

[ ] No protest accompanied the payment of additional search fees.

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member				
US	5585821	JP	6274305					
US	5473344	CA	2139696	EP	662669	JP	8030388
		US	5963197					
EP	454423	GB	2245092					

END OF ANNEX